December 1999/Vol. 31, No. 12

Science Bulletin

National Science Council
Republic of China

NSC Passed Comprehensive Planning Report for the "National Science and Technology Program for Pharmaceuticals and Biotechnology"

The National Science Council, Executive Yuan, held its 146th board meeting on August 24, 1999, and during this meeting the board passed a comprehensive planning report for the "National Science and Technology Program for Pharmaceuticals and Biotechnology." A conceptual plan for this program had been presented to minister without portfolio Yang Shih-chien and NSC chairman Hwang Jenn-tai on December 4, 1998, and an outline of the program was passed by the 143rd meeting of the NSC board. Hsu Ming-chu, director of the Biotechnology and Pharmaceutical Research Division of the National Health Research Institutes, was appointed program leader and overall planning began in January 1999. The first task was to establish five working groups and to recruit group leaders. Each group held two to four conferences between February and May of 1999. Approximately 80 professors and scientists from local research institutions were invited to attend and to map out programmatic objectives and propose specific research topics. A comprehensive planning report was submitted on July 12, 1999 to a steering committee chaired by minister without portfolio Yang Shih-chien and NSC chairman Hwang Jenn-tai. The proposed plans were passed, and the budget was discussed and confirmed at a later meeting chaired by NSC vice chairman Steve Hsieh. Funding for the program was divided between the Department of Health, Ministry of Eco-

Table 1 Sources of Funding for the "National Science and Technolgoy program for Pharmaceuticals and Biotechnology" and Estimated Needs for Three Years

Units: US$1,000

Source of Funding	Item	2000 Budget	2001 Estimated Need	2002 Estimated Need
Life Sciences Department, NSC	Special topic research	4,660	5,594	6,712
Department, of Health	National Health Research Institutes Integrated drug discovery core GCP pharmacokinetics Institute	5,030	6,029 932	7,241 1,243
	Bureau of Pharmaceutical Affairs Enforcement of the drug approval system and its operation	932	932[d]	1,088[d]
Industrial Technology Department, MOEA	New drug development project	2,330	2,564	2,820[e]
	Preclinical development[a]	–	466	1,398
	GMP Pilot Plant[b]	311	388	466
	MEMS Core facilities[c]	311	466	559
Total		13,574	17,371	21,527

a. It is anticipated that one candidate drug will undergo acute and subchronic toxicological testing in 2001, and chronic toxicological testing will begin the following year. Another candidate drug will undergo acute and subchronic toxicological testing in 2002. This project will apply for funding as a special sci-tech project.
b. It is anticipated that pilot production of an acquired or locally-developed drug will begin each year. This project will apply for funding as a privately sponsored sci-tech project.
c. The microsystem technology required by participating research organizations will be provided by the core facilities of the Industrial Technology Research Institute (ITRI). ITRI will apply for funding as a special sci-tech project.
d. Listed as administrative expenses in 2000. Will be listed as a sci-tech expense in 2001 and 2002.
e. New drug development projects will be proposed in 2001 and 2002. Funding will be applied for as special projects.

Fig. 2 The Bioprocess Engineering core at the Development Center for Biotechnology: Large Scale Purification System in Class 10,000 clean room.

Fig. 1 The integrated drug discovery core at the Division of Biotechnology and Pharmaceutical Research of NHRI: The "High-Throughput Robotic Drug Screening System" fully integrates all major components for drug screening, including reagents, consumables, hardware and software. The system can perform high-throughput cell-based assays as well as cell-free assays 24 hours a day with high efficiency.

nomic Affairs, and NSC, confirmed at a coordination meeting held on July 30, 1999 (see Table 1).

The goals of this program are: 1) to conduct mission-oriented R&D in pharmaceuticals and biotechnology; and 2) to establish infrastructures and facilitate commercialization of R&D products.

The program will chiefly focus on the development of therapeutic drugs and diagnostic techniques for locally-prevalent cancer and infectious disease. R&D of the following five programmatic areas will be conducted:

A. Natural products and synthetic chemicals: will focus on (1) the extraction, purification, and structural determination of natural drugs and (2) the design and synthesis of new drugs.
B. Antivirals and viral replication: focus includes (1) discover drugs against the hepatitis-C virus, the dengue fever virus, and the enterovirus; (2) establish general drug screening methods; (3) establish *in vitro* viral replication systems and animal disease models applicable to drug screen-ing; (4) determine the structure of anti-viral molecular targets; and (5) develop anti-viral drugs against other viruses infecting man and domestic animals.
C. Cancer therapy and biology: focus includes (1) establish cancer pathology specimen collections; (2) determine unique molecular markers in cancerous tissue; and (3) develop biological models of drug action.
D. Biopharmaceuticals: focus includes (1) develop and investigate the functions of monoclonal antibodies and their derivatives for therapeutic use; (2) utilize monoclonal antibodies to improve the diagnosis of cancer and other major illnesses; (3) prepare humanized monoclonal antibodies suitable for human diagnosis and therapy; and (4) research and develop novel proteins and derivatives with medical applications.
E. Biochips: focus includes (1) establish platform technologies for protein and chip interface, high-sensitivity measurement of protein reactions, microarray techniques, low-cost protein chip fabrication, and techniques for producing human proteins and their antibodies; and (2) develop packaging technologies for above systems.

In the near term, the programmatic goal will be identifying suitable drug candidates technologies or products for in-licensing. This shall shorten the time to market. The mid-and long-term goal is to build our competiveness in pharmaceuticals and biotechnology through effectively utilizing available resources and manpower, and speeding up the development of novel drugs and biochips.

921 Earthquake—Swift Recovery at Hsinchu Short Term Heavy Losses while Long Term Plan Already Worked out

The earthquake of Sept. 21 has caused serious power outages throughout the island, and Taiwan's most important center for high-tech industries, the Hsinchu Science-based Industrial Park (HSIP), was by no means spared. Luckily, no one was hurt within the park, and water and power utilities have been fully restored by Sept. 25. No damage to buildings or public facilities was incurred, and operations such as import/export of goods, customs, traffic as well as public safety and fire fighting are back to normal. Due to the damage to some production facilities and power outage, the production of some manufacturers was disrupted, causing losses in output and revenue.

To assist the manufacturers of the HSIP to quickly resume operation, the chairman and vice chairman of the National Science Council visited the HSIP several times since Sept. 22 to monitor the recovery process. They also urged the Ministry of Economic Affairs to give priority in restoring power supply to the Park. On Sept. 21, the Park Administration set up a disaster relieve operation center, which, in conjunction with the Utility Group of the Association of HSIP Industries, supervised the relieve efforts for the different industries. The Park Administration worked throughout the Mid-Autumn Festival weekend to assure a quick recovery of water, electricity and fuel supply, and sent specialists to check all buildings and public facilities for damages. At the same time, a special website was set up to update the public about the status of recovery within the Park, and a fax line was established to allow the companies of the HSIP to submit reports or to request help.

With the concerted effort of the government and all concerned parties, the power supply of the HSIP was completely restored on Sept. 25, and operation of most manufacturers has been resumed. After thorough inspection, repair and testing of the production facilities, the overall operation has, faster than expected, already returned to normal on Sept. 28. The impact of the earthquake was most serious on the semi-conductor production industry, whereas other industries such as computer and telecommunication were affected less. A first estimate puts the loss for chip-producing industries at NT $10 billion (US $312 million). With some losses covered by insurance and others made up through overtime work, the total loss of the manufacturers is much lower than expected. Overall, the industries of the HSIP and the industries closely related to the Park are all back to normal operations, and the outlook for future growth remains as positive as ever.

The earthquake of Sept. 21 demonstrated the importance of the semiconductor industry, mainly concentrated in the Hsinchu Science-based Industrial Park, for Taiwan's overall economy, and how closely it is tied to related industries around the world. Taiwan's semi-conductor industry, trailing only behind the United States, is the second most important in the world. The chip manufacturers of the HSIP are expected to take up an 85% global market share by next year, up from its current 64%. With this industry assuming such vital importance, the government assigned top priority in the reduction of adverse effects from natural disasters and the stable supply of utilities. To achieve this goal, the Science-based Industrial Park Administration is planning to establish a dedicated power plant within two years. Also being planned is an independent water supply from the second reservoir at Paoshan and Touchien River to the HSIP.

Introducing the "Summer Institute in Taiwan" Program

In an effort to promote international scientific interchange, the NSC engages in many forms of international cooperation, including personnel exchanges, seminars, and joint research projects. Among these different methods, it has been found that mutual visits can achieve enormous results at a very low cost, including such benefits as establishing cooperative relationships, exchanging research findings and experience, discussing

the feasibility of joint projects, and carrying out joint research.

As far as scientific cooperation between the ROC and the United States is concerned, the closest and longest-lasting relationship has been maintained by the NSC and the US National Science Foundation (NSF). Under the new "Summer Institute in Taiwan" program that the NSC and the NSF will begin conducting in 2000, up to ten American graduate students in the fields of science and engineering, including, will be able to visit and receive training in Taiwan for eight weeks in summer time every year. The NSC and the NSF will jointly support the program: The NSF will bear responsibility for each student's airfare and a US$2,500 stipend, while the NSC will bear responsibility for accommodations and allowances for food and professional travel within Taiwan. In addition, the NSF will handle students' applications and preliminary evaluation tasks, while the NSC will perform follow-up evaluations and bear responsibility for arranging activities in Taiwan. The short-term goal of the program is to give young American research workers a better understanding of the state of science and technology in the ROC, and it is hoped that it will lead to even closer and more enduring cooperative ties between the two countries' research personnel.

To facilitate the arrangement of common activities, the NSC has chosen to initially limit the program to the area north of Hsinchu, and has selected fourteen units, including national laboratories, university departments, the Taiwan Forestry Research Institute, and the Biotechnology Development Center, to participate. The NSC has commissioned National Tsinghua University to serve as the implementing unit and bear responsibility for planning, coordination, liaison, submission of expenses, and reporting of results. Students will stay in student dormitories at Tsinghua University during their first week in Taiwan, and will take part in activities that will include language training, an introduction to the ROC's sci-tech policies, an introduction to the current state of higher education, and cultural exchange classes. The students will be transferred to prearranged research units that fit their individual research specialties after the end of the first week, where they will participate in actual research work. The host research units will be responsible for the students' food, lodging, and transportation, until they return to the United States at the end of the eighth week.

This is not the first time that such a program has been held. In 1990 the NSF cooperated with Japan's Science and Technology Agency to conduct the "Summer Institute in Japan," and since then approximately 60 students have been sent every year to host units that include universities, government units, and national laboratories located in Tokyo and the Tsukuba Science City. In 1995 the NSF and the Japanese Ministry of Education, Science, Sports, and Culture began implementing the very similar "Monbusho Summer Program in Japan." Twenty Americans attend the "Summer Institute in Korea" conducted every year by the NSF and the Korea Science and Engineering Foundation since 1995. The forthcoming participation of the ROC will lend even more impetus to this type of program.

The success of this program lies in the fact that more high-level domestic research units will participate in the program to attract more outstanding American graduate students to Taiwan. Domestic organizations that would like to become host units may actively seek out American research institutes in related fields of study, and encourage interested graduate students to submit applications to the NSF. Suitable host units can be arranged for applicants who have not yet contacted any research organization in Taiwan. These features will allow students to gain a full understanding of the current state of science and technology in the ROC during their eight-week stay, and will help them establish lasting channels of communication and cooperation with domestic research personnel.

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國　外：Subscription price for each copy:US$1. Payment must be made in US dollars by a check payable to National Science Council.